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FAMILY LYCEUM.

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VOLCANOES.

GENERAL HISTORY OF MOUNT ETNA.

ETNA is the most striking phænomenon of the island of Sicily; and though less frequently delineated than Vesuvius, is so much more gigantic, that the latter, if placed by the side of it, would seem nothing more than a small ejected hill, and is in fact not longer than several of the mountains by which it is surrounded. The whole circuit of the base of Vesuvius does not exceed thirty miles, while Etna covers a space of a hundred and eighty miles, and its height above the level of the sea is computed at not less than eleven thousand feet: and while the lava of the first not often devolves its stream further than to an extent of seven miles, Etna will emit a liquid fire capable of traversing a path of thirty miles. The crater of Vesuvius, moreover, has seldom exceeded half a mile in circumference, while that of Etna is commonly three, and sometimes six miles. The best description of this crater, which we have received in our own day, is that given by Spalanzani. According to him, it forms an oval extending from east to west, inclosed by vast fragments of lava and scoriæ; the inner sides being of various declinations, incrusted with orange-colored concretions of muriat of ammonia, the sal ammoniac of the shops. The bottom is a plain nearly horizontal, about two thirds of a mile in circumference, with a large circular aperture, giving vent to a column of white smoke, below which is visible a liquid fiery matter, like metal boiling in a furnace. Such is the height of Etna, that its eruptions rarely attain its summit, but more usually break out at its sides. Near the crater begins the region of perpetual snow and ice; which is followed by a woody domain, consisting of vast forests of oaks, beeches, firs, and pines, while the areola of the crater is almost destitute of vegetation. In this middle region appear also chestnut trees of enormous size, one of which, distinguished by the name of *cento cavello* (troop of horses) measures not less than *two hundred and four feet* in circumference.

Etna is perhaps one of the oldest volcanoes in Europe; and though less minutely described by modern philosophers and travellers than Vesuvius, obtained far more of the attention of the Greek and Roman writers.—The fire which is so perpetually burning in its bowels induced the poets to place in this tremendous cavity the forges of the Cyclops, who were placed under the government of Vulcan, and the prison of the giants who rebelled against Jupiter. These fictions progressively grew into popular truths among the vulgar, who regarded Etna, in consequence, as the residence of Vulcan, and the seat of his empire. And hence they erected a temple to him on the mountain, in which, according to Ælian, a perpetual fire was maintained, in the same manner as in the temple of Vesta, this element being an appropriate Vulcanic symbol.

Homer makes mention of mount Etna, but at the same time takes no notice of its eruptive power; and hence there is a strong presumptive proof that its volcanic properties were unknown at that æra. Thucydides is the earliest historic writer that alludes to these phænomena. He enumerates three eruptions of the mountain towards the conclusion of his third book, one of which he fixes at four hundred and seventy-four years before the birth of our Saviour, a second fifty years later, while to the third he assigns no date whatever. Pindar composed an ode in the 78th Olympiad, about four or five years after the second eruption, and adverted to by Thucydides, in which he describes its violence, and retains the popular fable just alluded to, that Jupiter had buried the giants in its bowels, and that their struggle to get loose was the cause of the fiery commotion. Lucretius has referred to the volcanic powers of Etna in various places. In his sixth book he endeavors more philosophically to account for them; and he first describes the island of Sicily so picturesquely, and at the same time pays so elegant a compliment to Empedocles, who was a native of it, that we cannot forbear quoting the passage, which is as follows:—

Thus sung EMPEDOCLES, in honest fame,
First of his sect; whom Agrigentum bore
In cloud-capt Sicily. The sinuous shores,
Th' Ionian main, with hoarse unwearied wave
Surrounds, and sprinkles, with its briny dew;
And from the fair Æolian fields divides
With narrow frith that spurns the impetuous surge.
Here vast Charybdis raves; here Ætna rears
His infant thunders, his dread jaws unlocks,
And heaven and earth with fiery ruin threats;
Here many a wonder, many a scene sublime,
As on he journeys, checks the traveller's steps;
And shews, at once, a land in harvests rich,
And rich in sages of illustrious fame.
But nought so wondrous, so illustrious nought,
So fair, so pure, so lovely can it boast,
EMPEDOCLES, as thou! whose song divine,
By all rehears'd, so clears each mystic lore,
That scarce mankind believ'd thee born of man.

No country, indeed, has a juster right to boast of the men of learning it has produced than ancient Sicily. In proof of which it may be sufficient to add to the name of Empedocles, those of Æschylus, Diodorus Siculus, Gorgias, Euclid, Archimedes, Epicharmus, Theocritus.

CHRONOLOGICAL ACCOUNT OF THE SEVERAL FIRES OF MOUNT ETNA.

To pass by what is related by Berosus, Orpheus, and other less credible authors, about the eruptions of this mountain, both at the time of the ingress of the Ionian colonies into Sicily, and that of the Argonauts (which latter was in the twelfth age before the Christian account;) we shall first take notice of that which happened at the time of the expedition of Æneas, who being terrified by the fire of this then burning mountain, left that island; whereof Virgil gives this notable description:—

The wind now sinking with the lamp of day,
Spent with our toils, and dubious of the way;
We reach the dire Cyclopean shore, that forms
An ample port, impervious to the storms.
But Etna roars with dreadful ruins nigh,
Now hurls a cloud of bursting cinders high,
Involv'd in smoky whirlwinds to the sky;
With loud displosion, to the starry frame
Shoots fiery globes, and furious floods of flame;
Now from her bellowing caverns burst away
Vast piles of melted rocks in open day.
Her shatter'd entrails wide the mountain throws,
And deep as hell her burning centre glows.

After this we find in Thucydides, that in the 76th Olympiad, which is about 476 years before Christ, there was another fire, and about fifty years after, another.

Then, in the time of the Roman consuls, there happened four eruptions of Etna, recorded by Diodorus Siculus and Polybius.

The next was in the time of Julius Cæsar, related by the said Diodorus to have been so fierce, that the sea about Lipara (an island near Sicily) by its fervent heat burnt the ships, and killed all fishes thereabout.

Another we read of in the reign of Caligula, about forty years after Christ, which was so dreadful, that it made that Emperor, who was then in Sicily, to fly for it.

About the martyrdom of the Romish St. Agatha, it burned again very fiercely; though some say, that by virtue of her intercession, it was stayed from reaching Catania.

Again it burned A. C. 812, in the reign of Charles M.

Then from the year 1160 to 1669, all Sicily was shaken with many terrible earthquakes, and the eruptions of the same mountain destroyed a vast tract of inhabited land round about it, and reached as far as Catania; the cathedral of which it destroyed, and the religious men residing in it.

Again in the year 1264, there happened another terrible fire about the time of the death of Charles, king of Sicily and Arragon.

A. 1329 until 1333 there was another. A. 140 another.

A. 1414 another, which lasted till 1447.

A. 1536 another, which lasted a year.

A. 1633 another, continuing several years.

A. 1650, it burnt on the north-east side, and vomited so much fire, that by the fiery torrents, caused thereby, great devastation was made, as Kircher relates in his *Mundus Subterraneus:* whose assistance we have also made use of in the foregoing chronology, together with that of Philotheus.

The same author, having been in Sicily himself, observed, that the people of Catania, digging for pumice stones, do find at the depth of one hundred palms (which is about sixty-eight feet,) streets paved with marble, and many footsteps of antiquity; an argument, that towns have stood there in former ages, which may have been overwhelmed by the matter cast out of this mountain.—They have also found several bridges of pumice stones, doubtless made by the flux of the fiery torrents, the earth being very much raised since.

Now whether these eruptions are caused by actual subterraneous fires, lighting upon combustible matter; or by fire struck out of falling and breaking stones, whose sparks meet with nitro-sulphureous or other inflammable substances heaped together in the bowels of the earth, and by the expansive violence of the fire forced to take more room, and so bursting out with the impetuosity we see, may not be unworthy of a philosopher's speculation.

CHANGES, PRESENT STATE, AND PICTURESQUE SCENERY OF MOUNT ETNA.

Three hours before day, I, with my companions, left the Grotta delle Capre, which had afforded us a welcome asylum, though our bed was not of the softest, as it consisted only of a few oak leaves scattered over the floor of lava. I continued my journey towards the summit of Etna; and the clearness of the sky induced me to hope that it would continue the same during the approaching day, that I might enjoy the extensive and sublime prospect from the top of this lofty mountain, which is usually involved in clouds. I soon left the middle region, and entered the upper one, which is entirely destitute of vegetation, except a few bushes very thinly scattered. The light of several torches which were carried before us enabled me to observe the nature of the ground over which we passed, and to ascertain, from such experiments as I was able to make, that our road lay over lavas either perfectly the same with, or analogous to, those in which the Grotta delle Capre is hollowed.

We had arrived at within about four miles of the borders of the great crater, when the dawn of day began to disperse the darkness of night. Faint gleams of a whitish light were succeeded by the ruddy hues of Aurora; and soon after the sun rose above the horizon, turbid at first and dimmed by mists, but his rays insensibly became more clear and resplendent. These gradations of the rising day are nowhere to be viewed with such precision and delight, as from the lofty height we had reached, which was not far from the most elevated point of Etna.—Here, likewise, I began to perceive the effects of the eruption of Etna which took place in July, 1787, and which has been so accurately described by the Chevalier Gioeni. These were visible in a coating of black scoriæ, at first thin, but which became gradually thicker as I approached the summit of the mountain, till it composed a stratum of several palms in thickness. Over these scoriæ I was obliged to proceed, not without considerable difficulty and fatigue, as my leg at every step sank deep into it. The figure of these scoriæ, the smallest of which are about a line or somewhat less in diameter, is very irregular. Externally they have the appearance of scoriæ of iron; and, when broken, are found full of small cavities, which are almost all spherical, or nearly of that figure. They are, therefore, light and friable; two qualities which are almost always inseparable from scoriæ. This great number of cavities is an evident proof of the quantity and vigorous action of the elastic fluids, which in this eruption, imprisoned in the liquid matter within the crater, dilated it on every side, seeking to extricate themselves; and forced it, in scoriaceous particles, to various heights and distances, according to the respective weights of those particles. The most attentive eye cannot discover in them the smallest shoerl; either because these stones have been perfectly fused, and with the lava passed into one homogeneous consistence; or because they never existed in it. Some linear feltspars are however found, which by their splendor, semi-transparency, and solidity, shew that they have suffered no injury from the fire. When these scoriæ are pulverised, they become extremely black; but retain the dryness and scabrous contexture which they had when entire. They abound in iron, and in consequence the dust produced by pulverising them copiously adheres to the point of a magnetized knife; and a small piece of these scoriæ will put the magnetic needle in motion at the distance of two lines.

In the midst of this immense quantity of scoriæ, I, in several places, met with some substances of a spherical figure, which, like the lava, were at first small, but increased in size as I approached the summit of the mountain. These were originally particles of lava ejected from the crater in the eruption before mentioned, which assumed a spherical figure when they were congealed by the coldness of the air. On examining them, I found them in their qualities perfectly to resemble the scoriæ, and to possess the same magnetism.

Only two miles and a half remained of our journey, when the great laboratory of nature, inclosed within the abysses of Etna, began its astonishing operations. Two white columns of smoke arose from its summit; one, which was the smallest, towards the north-east side of the mountain; and the other, towards the north-west. A light wind blowing from the east, they both made a curve towards the west, gradually dilating, until they disappeared in the wide expanse of air. Several streams of smoke, which arose lower down, towards the west, followed the two columns. These appearances could not but tend to inspire me with new ardor to prosecute my journey, that I might discover and admire the secrets of this stupendous volcano. The sun, likewise, shining in all his splendor, seemed to promise that this day should crown my wishes.—But experience taught me that two miles and a half I had yet to go presented many more obstacles than I could have imagined, and that nothing but the resolution I had formed to complete my design at every hazard could have enabled me to surmount them.

Having proceeded about a hundred paces further, I met with a torrent of lava, which I was obliged to cross, to arrive at the smoking summit. My guides informed me that this lava had issued from the mountain in October, 1787; and as the account of the Chevalier Gioeni, which I have above cited, only mentions the eruption of the month of July of the same year, I shall here give a brief description of it; as it does not seem hitherto to have been described.

This very recent lava extends three miles in length; its breadth is various, in some places being about a quarter of a mile, in others one-third, and in others still more.—Its height, or rather depth, is different in different parts; the greatest being, as far as I was able to observe, about eighteen feet, and the least six. Its course is down the west side of the mountain; and, like the other lava which flowed in the July of 1787, it issued immediately from the great crater of Etna. The whole number of the eruptions of this mountain of which we have any record, before and after the Christian era, is thirty-one; and ten only, as we are informed by Gioeni, including that of which he has given an account, have issued immediately from the highest crater. That which I observed may be the eleventh, unless it should rather be considered as the same with that described by the Sicilian naturalist; since the interval between August and October is a very short intermission of rest for a volcano. The cause of the rarity of the eruptions which issue immediately from the crater, compared with those which disgorge from the sides, seems easily to be assigned. The centre of this volcano is probably at a great depth, and perhaps on a level with the sea. It is therefore much more easy for the matter liquified by the fire, put in effervescence by the elastic fluids, and impelled on every side from the centre to the circumference, to force its way through one of the sides of the mountain where it finds least resistance, and there form a current, than to be thrown up, notwithstanding the resistance of gravity, from the bottom to so great a height as the highest crater of Etna. It is evident, therefore, that the effervescence in the eruptions of the months of July and October, 1787, was extremely violent. The torrent of the month of October is everywhere covered with scoriæ, which resemble those ejected in the month of July in their black color, but differ from them in the great adhesion they have to the lava, in their exterior vitreous appearance, their greater weight, and their hardness, which is so great that they give sparks with steel almost as plentifully as flints. These differences, however, are to be attributed only to accidental combinations of the same substance; the constituent principles of the scoriæ of this lava not being different from those of the detached scoriæ mentioned above. Both, likewise, contain the same feltspar lamellæ.

This new current was, however, extremely

difficult, and even dangerous, in the passage. In some places the scoriæ projected in prominent angles and points, and in others sunk in hollows, or steep declivities: in some, from their fragility and smoothness, they resembled thin plates of ice, and in others they presented vertical and sharp projections. In addition to these difficulties, my guides informed me I should have to pass three places where the lava is still red-hot, though it was now eleven months since it had ceased to flow. These obstacles, however, could not overcome my resolution to surmount them, and I then experienced, as I have frequently done at other times, how much may be effected in difficulties and dangers like these, by mere physical courage, by the assistance of which we may proceed along the edge of a precipice in safety; while the adventurer, who suffers himself to be surprised by a panic fear will be induced cowardly to desist from the enterprise he might have completed. In several places, it is true, the scoriæ broke under my feet; and in others I slipped, and had nearly fallen into cavities from which I should have been with difficulty extricated. One of the three places pointed out by the guides had likewise, from its extreme heat, proved highly disagreeable; yet, at length, I surmounted all these obstacles and reached the opposite side, not without making several cursory observations on the places whence those heats originated. Two large clefts, or apertures, in different places appeared in the lava, which there, notwithstanding the clearness of the day, had an obscure redness; and on applying the end of the staff which I used as a support in this difficult journey, to one of these, it presently smoked, and, immediately after, took fire. It was therefore indubitable, that this heap of ejected lava still contained within it the active remains of fire, which were more manifest there, than in other places, because those matters were there collected in greater quantities.

I had yet to encounter other obstacles.—I had to pass that tract which may properly be called the cone of Etna, and which, in a right line, is about a mile, or somewhat more in length. This was extremely steep, and not less rugged, from the accumulated scoriæ which had been heaped upon it in the last eruption, the pieces of which were neither connected together, nor attached to the ground; so that, frequently, when I stepped upon one of them, before I could advance my other foot, it gave way, and, forcing other pieces before it down the steep declivity, carried *me* with it, compelling me to make many steps backwards instead of one forwards. To add to this inconvenience, the larger pieces of scoriæ above that on which I had stepped, being deprived of the support of those contiguous to them, came rolling down upon me, not without danger of violently bruising my feet, or breaking my legs. After several ineffectual attempts to proceed, I found the only method to avoid this inconvenience and continue my journey, was to step only on those larger pieces of scoriæ which, on account of their weight, remained firm: but the length of the way was thus more than doubled, by the circuitous windings it was necessary to make to find such pieces of scoriæ as from their large size were capable of affording a stable support. I employed three hours in passing, or rather dragging myself to the top of the mountain, partly from being unable to proceed in a right line, and partly from the steepness of the declivity, which obliged me to climb with my hands and feet, sweating and breathless, and under the necessity of stopping at intervals to rest, and recover my strength. How much did I then envy the good fortune of those who had visited Etna before the eruption of 1787, when, as my guides had assured me, the journey was far less difficult and laborious.

I was not more than a hundred and fifty paces distant from the vertex of the cone, and already beheld close to me, in all their majesty, the two columns of smoke. Anxious to reach the borders of the stupendous gulph, I summoned the little strength I had remaining, to make a last effort, when an unforeseen obstacle, for a moment, cruelly retarded the completion of my ardent wishes. The volcanic craters, which are still burning more or less, are usually surrounded with hot sulphureous acid streams, which issue from their sides, and rise in the air. From these the summit of Etna is not exempt; but the largest of them rose to the west, and I was on the south-east side.—Here, likewise, four or five streams of smoke arose, from a part somewhat lower; and through these it was necessary to pass; since on one side was a dreadful precipice, and on the other so steep a declivity, that I and my companion, from weakness and fatigue, were unable to ascend it; and it was with the utmost difficulty that our two guides made their way up it, notwithstanding they were so much accustomed to such laborious expeditions. We continued our journey, therefore, through the midst of the vapors; but though we ran as fast as the ground and our strength would permit, the sulphureous steams with which they were loaded were extremely offensive, and prejudicial to respiration; and affected me, in particular, so much, that for some moments I was deprived of sense; and found, by experience, how dangerous an undertaking it is to visit volcanic regions invested by such vapors.

(To be continued.)

Improvements in Black Writing Ink.

When the sulphate of iron, and the infusion of galls, are added together, for the purpose of forming ink, we may presume that the metallic salt or oxide enters into combination with at least four proximate vegetable principles—gallic acid, tan, mucilage, and extractive matter, all of which appear to enter into the composition of the soluble parts of the gall-nut. It has been generally supposed that two of these, gallic acid and the tan, are more especially necessary to the constitution of ink; and hence it is considered, by our best systematic writers, to be essentially a tanno-gallate of iron. It has been also supposed that the peroxide of iron alone possesses the property of forming the black compound which constitutes ink, and that the substance of ink is rather mechanically suspended in the fluid than dissolved in it.

Ink, as it is usually prepared, is disposed to undergo certain changes, which considerably impair its value: of these the three following are the most important: its tendency to moulding, the liability of the black matter to separate from the fluid, the ink then becoming what is termed ropy; and its loss of color, the black first changing to brown, and, at length, almost entirely disappearing.

Besides these, there are objects of minor importance to be attended to in the formation of ink. Its consistence should be such as to enable it to flow easily from the pen, without, on the one hand, its being so liquid as to blur the paper, or, on the other, so adhesive as to clog the pen, and to be long in drying. The shade of color is also not to be disregarded; a black, approaching to blue, is more agreeable to the eye than a browner ink; and a degree of lustre, or glossiness, if compatible with the due consistence of the fluid, tends to render the characters more legible and beautiful.

With respect to the chemical constitution of ink, I may remark, that although, as usually prepared, it is a combination of the metallic salt or oxide, with all the four vegetable principles mentioned above; yet I am inclined to believe that the last three of them, so far from being essential, are the principal cause of the difficulty which we meet with in the formation of a perfect and durable ink. I endeavored to prove this point by a series of experiments, of which the following is a brief abstract. Having prepared a cold infusion of galls, I allowed a portion of it to remain exposed to the atmosphere, in a shallow capsule, until it was covered with a thick stratum of mould; the mould was removed by filtration, and the proper proportion of sulphate of iron being added to the clear fluid, a compound was formed of a deep black color, which showed no farther tendency to mould, and which remained for a long time without experiencing any alteration.

Another portion of the same infusion of galls had solution of isinglass added to it until it no longer produced a precipitate; by employing the sulphate of iron, a black compound was produced, which, although paler than that formed from the entire fluid, appeared to be a perfect and durable ink. Lastly, a portion of the infusion of galls was kept for some time at the boiling temperature, by means of which a part of its contents became insoluble; this was removed by filtration, when, by the addition of the sulphate of iron, a very perfect and durable ink was produced. In the above three processes I conceive that a considerable part of the mucilage, the tan, and the extract, were respectively removed from the infusion, while the greater part of the gallic acid would be left in solution.

The three causes of deterioration in ink, the moulding, the precipitation of the black matter, and the loss of color, as they are distinct operations, so we may presume that they depend on the operation of different proximate principles. It is probable that the moulding more particularly depends on the mucilage, and the precipitation on the extract, from the property which extractive matter possesses of forming insoluble compounds with metallic oxides. As to the operation of the tan, from its affinity for metallic salts, we may conjecture, that, in the first instance, it forms a triple compound with the gallic acid and the iron; and that, in consequence of the decomposition of the tan, this compound is afterwards destroyed. Owing to the difficulty, if not impossibility, of entirely depriving the infusion of galls of any one of its ingredients, without, in some degree, affecting the others, I was not able to obtain any results which can be regarded as decisive; but the general result of my experiments favours the above opinion, and leads me to conclude, that, in proportion as ink consists merely of the gallate of iron, it is less liable to decomposition, or to experience any kind of change.

The experiments to which I have alluded above, consisted in forming a standard infusion by macerating the powder of galls in five times its weight in water, and comparing this with other infusions, which had either been suffered to mould, from which the tan had been abstracted by gelatine, or which had been kept for some time at the boiling temperature; and by adding to each of these respectively, both the recent solution of the sulphate of iron, and a solution of it, which had been exposed for some time to the atmosphere. The nature of the black compound produced was examined by putting portions of it into cylindrical jars, and observing the changes which they experienced with respect either to the formation of mould, the deposition of their contents, or any change of color. The fluids were also compared, by dropping portions of them upon white tissue paper, in which way both their color and their consistence might be minutely ascertained. A third method was, to add together the respective infusions, and the solutions of the sulphate of iron, in a very diluted state, by which I was enabled to form a more correct comparison of the quantity, and of the state of the coloring matter, and of the degree of its solubility.

The practical conclusions that I think myself warranted in drawing from these experiments, are as follow:—In order to procure an ink which may be little disposed either to mould or to deposit its contents, and which, at the same time, may possess a deep black color, not liable to fade, the galls should be macerated for some hours in hot water, and the fluid be filtered; it should then be exposed for about fourteen days to a warm atmosphere, when, any mould which may have been produced, must be removed. A solution of sulphate of iron is to be employed, which has also been exposed for some time to the atmosphere, and which, consequently, contains a certain quantity of the red oxide of iron diffused through it. I should recommend the infusion of galls to be made of considerably greater strength than is generally directed; and I believe that an ink, formed in this manner, will not necessarily require the addition of any mucilaginous substance to render it of a proper consistence.

I have only further to add, that one of the best substances for diluting ink, if it be, in the first instance, too thick for use, or afterwards becomes so by evaporation, is a strong decoction of coffee, which appears in no respect to promote the decomposition of the ink, while it improves its color, and gives it an additional lustre.—[*Arcana of Science and Art.*

Decrepitating Common Salt—Condensation of Gas in It.

M. Dumas has examined and described a very curious effect which occurred when some rock-salt, obtained from the mine of Wieliczka, in Poland, and given to him by M. Boue, was put into water. It decrepitated as it dissolved in water, and gradually evolved a sensible portion of gas. The bubbles of gas were sensibly larger when the decrepitations were stronger, and the latter frequently made the glass tremble.—This salt owes its property of decrepitating to a gas, which it contains in a strongly-compressed state, although no cavities are sensible to the eye. When the experiment was made in perfect darkness, no light was disengaged. The gas disengaged is hydrogen slightly carbonated; when mixed with air, it burns by the approach of a lamp.

This disengagement of gas will assist in explaining the numerous accidents which have happened from fire-damp in salt mines. Several portions of the salt were nebulous, others were transparent. The nebulosities indicated the existence of numerous minute cavities, probably filled with condensed gas, and, in fact, a nebulous fragment, dissolved in water, gave more gas than an equal-sized fragment of the transparent salt.

This new fact, described by M. Dumas, shows how frequent, in the course of geological accidents, are the phenomena which give rise to the accumulation of gas in the cavities of mineral substances, and how varied are the substances upon which these phenomena have been exerted. M. Dumas has endeavored to reproduce salt having the power of decrepitating in water like that described.

THE ARTS.

Coloring Glass.

It appears probable that the art of coloring glass was discovered and prosecuted at a period very little subsequent to that of the manufacture of the article itself. The most ancient authors who have mentioned the existence of the material, have also recorded the fact of its being tinged with various colors, in imitation of gems. Strabo, Seneca, and Pliny, all make mention of this use, as being one to which glass was applied by artists in very early times.

The fact has already been mentioned of colored figures having been found with Egyptian mummies, and which are, therefore, known to have been in existence for upwards of 3000 years. These curious relics of ancient times have also been discovered decorated with colored glass beads; and a mummy thus ornamented is to be seen in the British Museum.

In the reign of Augustus, the Romans began the use of colored glass in the composition of mosaic decorations. Several specimens of this kind have been found at a late period, among the ruins of a villa built by Tiberius in the island of Capri; and some of these specimens having been subjected to analysis by the accurate and ingenious Klaproth, it is known that in that early time recourse was had to the same class of coloring ingredients as is employed by the moderns. Some difference must, indeed, have been observed in their processes, as the ancients were unacquainted with the use of the mineral acids, which are now found to be so convenient in the preparation of metallic oxides.

Klaproth has given the following as the result of his examination of some of the Roman specimens above mentioned:—

One which was a lively copper red, opaque, and very bright where recently fractured, contained, in 200 grains,—

Silex	142
Oxide of lead	23
copper	15
iron	2
Alumine	5
Lime	3
	195

Another, a light verdigris green, also opaque, with a splendent fracture and scoriaceous, contained in a similar quantity,—

Silex	130
Oxide of copper	20
lead	15
iron	7
Lime	13
Alumine	11
	196

It is remarkable that the constituent ingredients of both these specimens should prove to be the same. The difference between them exists only in their relative proportions; and the colors depend upon the different degrees of oxidation of the copper. Sub-oxide of copper,—that is, copper which has combined with itself only half the quantity of oxigen required for the production of the perfect oxide—produces a red enamel; while that which has received its full proportion of oxigen yields a green enamel color.

The specimen of ancient blue glass which was analyzed by Klaproth contained,

Silex	163 parts.
Oxide of iron	19
copper	1
Alumine	3
Lime	0½
	186½

It appears, therefore, to have been indebted to the oxide of iron for its blue color, as no trace was detected of any other ingredient to which this could be referred. Since the discovery of the certain and commodious method of producing blue enamel by means of cobalt, the art of obtaining this color from iron has been lost.

The causes which influence the employment of metallic oxides for the embellishment of porcelain have been sufficiently detailed in the preceding treatise. The same reasons also oblige the artist to have recourse to the same class of substances for imparting colors to glass. The mode of application of coloring materials to these two branches of manufacture differs, however, in this,—that while, in ornamenting porcelain, they are applied superficially, in

the manner of pigments, they enter more intimately into the composition of glass, being transfused through the whole mass, and equally incorporated with its entire substance.

The preparation of metallic oxides as coloring materials is nearly similar in all cases; it will not, therefore, be necessary here to repeat directions, or to give many explanations upon that head.

Gold, in a state of great division and oxidated, has long been celebrated as a means for imparting to glass a most exquisite purple-red color resembling the ruby, and nearly equalling that gem in the richness of its hue. It is not by any means easy to prepare glass of this color with any certainty of a successful result. The great tendency which is shown by gold to assume the reguline state, when exposed to excessive heat, to carbonaceous vapors, or to the action of hydrogen, renders necessary a great degree of careful management in the various processes.

The manner has already been given of preparing the purple precipitate of Cassius; the form wherein gold has been used with so much celebrity in imparting red and purple colors. It has been very generally imagined, that the tin used in the preparation of this precipitate is essential to the production of the requisite color; an opinion which has been shown to be void of foundation, as preparations of gold have been made without the agency of tin, and which have equally possessed the power of imparting a fine purple color to glass. The coloring property of any of the simple oxides of gold is found to be materially greater than that of Cassius's precipitate; which circumstance has been brought forward as another argument to prove that the presence of tin is far from adding any thing to the body of the color. It is probable, however, that, although not indispensable, tin is yet useful, as enabling the gold to bear without reduction a higher degree and a longer continuance of heat. With this same object, it has been recommended to add to the precipitate, before using it, a small quantity of nitre, by which the gold will be preserved at its due degree of oxidation.

A very ingenious process has been used for producing an intimate union between the oxide of gold and silex. This consists of adding to the solution of the metal in nitro-muriatic acid, a proportion of silica dissolved in alkaline lixivium, and pouring therein any acid in sufficient quantity to saturate the alkali. In this case, the silex and gold are precipitated in very intimate combination; and if then washed with clear water, dried, and mixed with nitre, borax, or any other suitable fluxing substance, will be fit for use as a coloring material.

Atmospheric Carbonic Acid.

M. Theod De Saussure has made numerous experiments to determine the variations of carbonic acid in the atmosphere, and published them in the memoirs of the Physical and Natural History Society of Geneva. The following results are extracted from the *Bibliotheque Universelle* for June, 1830:

The carbonic acid was absorbed by barytes water, and the carbonate precipitated was estimated to contain 22 per cent. of carbonic acid. The experiments were made at Chambeisy, about three quarters of a league distant from Geneva, and 16 metres above the level of the lake; 10,000 volumes of air contain 4.15 of carbonic acid, as the mean of 104 experiments made day and night and at all seasons of the year; the air was taken four feet above the ground; the greatest quantity of carbonic acid was 5.74, and the smallest 3.15.

An increased quantity of rain appears to diminish that of the carbonic acid, either by dissolving it or in causing the soil to do so; a litre of fresh rain water, which did not render lime-water turbid, gave in summer, by an hour's boiling, 20.5 cubic centimetres of air, which contained 13.46 of azote, 6.73 of oxigen, and 0.31 of carbonic acid: and it appears from a very elaborate set of experiments, that the quantity of carbonic acid is generally larger as that of the rain is smaller:—thus in June, 1827, the quantity of rain was 9 millimetres, and that of the carbonic acid 5.18, in 10,000 of air; while in September, 1829, the rain was 254 millimetres, and the carbonic acid only 3.57 volumes in 10,000 of air.

It was found that during the night the quantity of carbonic acid was greater than that of the day in the proportion of 4.32 to 3.98; but if the wind be strong, then scarcely any difference occurs. The greater quantity of carbonic acid occurring in the night is attributed to the want of decomposition which occurs by vegetation during the day.

A short frost and which does not penetrate the earth to more than an inch, does not appear to cause any variation in the quantity of carbonic acid; but when the frost continues long, the dryness which it occasions increases the proportion. In the beginning of January, 1829, the ground was lightly covered with snow, and the quantity of carbonic acid increased to 4.57; towards the end of the month it thawed for several days, and the acid was then reduced to 4.27. At the beginning of February the frost recommenced, and in the middle of the month the ground was frozen to the depth of eight inches; the carbonic acid rose to 4.52, it then thawed and the acid was reduced to 3.66.

The mean result of numerous experiments showed that the quantity of carbonic acid in 10,000 of air was less when taken over the lake of Geneva than at Chambeisy in the proportion of 4.39 to 4.60.

It was also found that the variations in the quantity of carbonic acid dependent upon season and night and day, occurred also in the air taken over the lake.

On comparing the quantity of carbonic acid found in the air of Geneva with that of Chambeisy, the former was found to be greater in the proportion of 4.68 to 4.37; these were the mean results of many experiments. It was also found that the quantity of carbonic acid is greater during day in the city than in the country, that the variations occasioned by the seasons are analogous, and that the quantity of carbonic acid increases more by the influence of night in the country than in the town.

On comparing the quantities of carbonic acid found in the air of the plains with that of the mountains, it was observed that the latter contained the most; this difference is explained by the consideration that the decomposition of the acid occurs principally where vegetation is most abundant, as it is in the plains, and that the gas is absorbed by the earth there, because it contains more rain-water. It appears also that the night has but little influence in increasing the carbonic acid of the mountain air.—[*Arcana.*

School Agents.

The agents engaged by the School Agent Society to act during the months of May and June in behalf of summer schools, are John Adams, late principal of Philips Academy, S. R. Hall, Principal of Teachers' Seminary, Andover, Dr. Uriah Turner New York, F. A. Barton and L. Tenney, Associates teachers with Mr. Hall, A. R. Baker, Samuel Beaman, Henry Eddy, Joseph Sherman, John O. Taylor, Thomas Kidder, S. H. Waldo, B. B. Newton E. Loomis, and J. Huntington, all experienced teachers.

Mr. Adams Dr. Turner, Mr. Taylor, and Mr. E. Loomis will visit some parts of New York and Ohio; Mr. Hall the north parts of Massachusetts, and the south part of New Hampshire; Mr. Tenney and Mr. Kidder will labor in Vermont, Mr. Baker in New Hampshire; Mr. Beaman and Mr. Sherman in Maine; Mr. Waldo and Mr. Eddy in Connecticut; Mr. Newton and Mr. Barton in the southern part of Massachusetts; and Mr. Huntington in Illinois,

It is the particular request and understanding that the agents are all to direct their efforts to the improvement of common schools, and during the operations the present season. To secure this object, it is expected they will present such improvements, and illustrate them in such a way, that every lady and gentleman who witness them, can introduce them *immediately* into their schools, and for the the benefit of every one of their pupils.

As a large majority of summer schools are in the charge of ladies, it is important, if not indispensable to give them the advantage of meetings proposed by the agents, that they should be provided with facilities for attending them by their school committee, or some friends of their schools.

An opportunity will be given for those who may attend the meetings, to examine Hall's Lectures to School Teachers, and a proposal for them to be furnished with them, which is the easiest and surest way to put teachers and schools into a rising state, and eventually to give them an elevated character.

The agencies and meetings now proposed by the School Agent Society are intended only as introductory to a more general and systematic train of measures, designed for the advancement of *common* education through our country and the world.

Such being the designs of the Society, which must require funds to be carried into effect, an opportunity will be given by the agents, for those who receive the benefit of their services, to contribute in their turn for the great and common cause of Education.

JOURNAL OF THE WEATHER IN WALTHAM, 1832.

	FACE OF THE SKY. Fair.	Rain.	Snow.	Cld'y.	WINDS. sw.	w.	sw.	ne.	e.	se.	Inches Rain.	Inches Snow.	Th'm'er. Av'ge.
January.	17	2 1-2	1 1-2	10	9	3	12	4	2	1	5.18	14	27 4-5
February.	10 1-2	2	3 1-2	13	5		15	5	2	2	3.11	29	29 1-6
March.	17	4	1	9	15		11	3		2	3.27	1-2	38
April.	15	6	1	8	6	1	9	8	3	3	5.42	2	42 3-4
May.	11	8		12	7		8	5	9	2	7.41		55 1-4
June.	16	1		13	12	2	6	3	6	1	.54		66
July.	14	2		17	11	3	6	2	7	2	3.23		69 1-6
August.	17 1-2	4		9 1-2	17	2	4		8		5.83		71 1-10
September.	22	2		6	10		10	3	5	2	1.78		61 2-3
October.	11	2		18	10	1	11	2	5	2	3.13		53 2-3
November.	13	3	1	13	13		11	3	2	1	3.62	1	41 1-4
December.	12	5	1	13	4		15	9	3		4.69	6	32 2-5
	176	41	9	140	119	12	118	47	52	18	47 1-5	43 1-2	49°

Highest range of the Thermometer July 2d, 2 o'clock, P. M., 92 degrees above zero.
Lowest range of the Thermometer January 27. Sunrise 19 degrees below zero.
Warmest day July 2d. The Thermometer averaged 81 degrees above zero.
Coldest day January 27. The Thermometer averaged 4 degrees above zero.

METEOROLOGY OF CONCORD.

In Lat. 43° 12'.

FOR MARCH, 1833.

Date	grea.	lea	mea.	winds.	weather.
1	16	6	11	NE	snow through the day.
2	24	6†	11	N NW	cloudy, squallish. wds.
3	18	9†	8	NW SW	fair.
4	18	6†	8	NW	fair and pleasant.
5	15	4†	9	NW	the same.
6	26	8	17	NW	the same—cloudy sr.
7	31	4†	18	W SW	fair—snow.
8	41	22	32	NW	cloudy—fair
9	42	22	32	NW	fair and pleasant.
10	37	15	25	NW	" "
11	34	18	27	NW	cloudy—snow.
12	40	27	35	N SW	cloudy—some rain.
13	35	22	32	NW	cloudy—fair.
14	32	17	24	NW	fair.
15	44	26	34	W NW	snow morn.—fair.
16	35	22	27	NW	fair and pleasant.
17	39	7	26	NW	" "
18	49	17	35	W SW	" "
19	62	34	44	W SW	clouds—fair.
20	41	36	38	S	cloudy—rain P. M.
21	59	36	45	W SW	cloudy—rain evening.
22	59	34	49	NW	fair and pleasant.
23	56	35	43	NW	" "
24	52	29	39	S	" "
25	54	34	42	NE	cloudy—fair.
26	37	29	34	NW	" "
27	36	24	29	NW	fair and pleasant.
28	35	24	28	NW	the same, and wind.
29	36	19	29	NW	fair.
30	40	29	33	NW SW	fair—high winds.
31	60	24	43	NW	fair and pleasant.

Greatest degree of heat, 62° on the 19th.
Greatest degree of cold, 9° below zero, on the 3d. —a greater degree of cold than has occurred in the month of March during the last 24 years.
Mean for the month, has been 29 degrees.

American School Agent Society.

During the late convention of Teachers at Andover the Directors have

Resolved, That it is expedient to request Conventions of Teachers and the friends of Education, to be held in each county, in New England and New York, in the month of May or June next, and that able and well qualified Agents be engaged to attend such conventions.

The Directors are now able to state that the services of such Agents have been secured, and that each county in New England and most of those in New York may receive a visit from some of them, during the next or succeeding month.

A deep conviction of the great value of common schools, together with the almost universal acknowledgement, that there are prominent defects in many of them, have been the leading causes of this effort. The prominent and specific objects to be obtained by it are the following:

1. To obtain information of the actual state of schools, and the origin of the most prominent defects in them.

2. To disseminate information calculated to provide a remedy for defects, and also to elevate the character and usefulness of these primary fountains of knowledge. It is hoped that such improvements as have been *thoroughly tested*, may be made known and explained, for the benefit of schools generally.

3. To make known the loud call for well qualified teachers, in the destitute parts of our own and other countries, and to encourage young men of proper character to qualify themselves for the profession of Teachers.

4. To make known the objects of the *American School Agent Society*, and present its claims to the public, and also to collect funds in aid of the general objects of the society; but especially, to enable it to send an Agent south and west, and also to *Greece*, to promote the cause of education in those places.

5. To promote the formation of County Associations, and wherever practicable to advance the cause of elementary and useful education.

The Directors hope that much may be done at the several meetings, which shall be highly beneficial to the interests of education and the happiness of man.

Editors of newspapers throughout New England and New York are respectfully requested to give the above an insertion in their respective journals.

S. R. HALL, *Chairman of the Executive Committee.*

Andover, April 22, 1833.

Massachusetts Lyceum.

The annual meeting of the Massachusetts Lyceum was held in the Representatives' Chamber on the evening of the 20 ult, Hon. A. H. Everett, President, in the chair. The report was read by Mr. Josiah Holbrook, Recording Secretary; Rev. W. C. Woodbridge, Corresponding Secretary, made a report respecting the American Lyceum and its last annual meeting; and statements were made by several gentlemen from different parts of the state,—after which a committe of one from each county was appointed to report on the state of Lyceums in this Commonwealth, at an adjourned meeting.

On motion of the Rev. Mr. Pierpont,

Voted, That the generous donation from the Bowdoin Hall School Lyceum of a set of geological specimens, with a tract to explain them, to every school in this Commonwealth, is entitled to the approbation and the thanks of this Institution.

The Lyceum then adjourned to March 27.

At the adjourned meeting, after the Report of the Committee, the following resolutions were submitted and unanimously adopted.

On motion of Mr. Emerson of Boston,

Resolved, That we have heard with pleasure the interesting report from the American Lyceum, by the Secretary, and approve of the objects and measures of that Institution.

On motion of Rev. W. C. Woodbridge of Boston,

Resolved, That the Massachusetts Lyceum recommend to all the town and county lyceums and schools in this Commonwealth, to co-operate with the National Society in the objects and measures proposed by it, especially the collection of Cabinets of Natural History, and in a system of exchanges with literary institutions and individuals in all sections of the country.

On motion of Mr. Greene of New Bedford,

Resolved, That the introduction of Natural History into common schools, will be calculated to increase their usefulness and elevate their character.

On motion of Mr. Hastings, of Boston,

Resolved, That the collection of Cabinets of Natural History, in all our towns and villages throughout the country, and of a central deposit at New York, would be calculated to open new sources of industry and of wealth to our nation.

On motion of Rev. Mr. Gannett, of Boston,

Resolved, That Cabinets of Natural History, deposited in towns and villages throughout the country, would furnish less expensive and more valuable amusements to young people than those which often occupy their attention.

After the close of the public exercises, the Lyceum proceeded to choose officers for the ensuing year, and delegates to attend the annual meeting of the American Lyceum, to be held in the city of New York on the first of May.

The officers elected are,

Hon. A. H. Everett, President; Rev. W. C. Woodbridge, Corresponding Secretary; Mr. Josiah Holbrook, Recording Secretary; Mr. T. H. Carter, Treasurer; Messrs. William Jackson, T. A. Green, S. C. Phillips, W. S. Hastings. Abraham R. Thompson, S. J. Gardner, Joseph Brown, and Joseph Jenkins, Curators. The Presidents of county Lyceums are as such vice presidents of this institution.

The following gentlemen were appointed delegates: the President and Secretaries, Hon. Edward Everett, Mr. Frederick Emerson, and Mr Chester Dewey.

The Colonizationist and Journal of Freedom.—The first number of a Magazine of thirty-two pages, bearing this title, has just been issued from the Lyceum Press, by G. W. Light & Co. It is 'unpledged to any party or to any system,' and, if we may judge from the specimen number, will pursue, what the editors say they are determined to pursue, an independent path, making TRUTH alone the polar star of all their efforts. This number contains several very able and interesting papers, together with a fine engraving of the 'Moorish Prince.' We would advise all who wish to examine a candid exhibition of the principles and operations of the American Colonization Society, and the prospects of the Colony of Liberia, in the shortest possible way, to subscribe for this Magazine.—The price is only $2 a year.

Education in Africa will constitute a topic for remarks in future numbers of the Lyceum.

BOOK OF NATURE.

THE FIXED STARS.

'This prospect vast, what is it?—Weighed aright,
'Tis Nature's system of Divinity;
And every student of the night inspires.
'Tis elder scripture writ by GOD's own hand.'

WHAT a glorious prospect does night unfold, when she draws aside her sable curtains, and displays to the contemplative mind the azure canopy of the heavens bedecked with stars! We need not wonder at the expression of the poet:

'DEVOTION! daughter of Astronomy!
An *undevout astronomer* is mad!'

For who can take even the most transitory glance of these glowing beauties on a fine frosty evening, without feeling something of that undescribable impulse which every good man must feel when casting his eyes to the nocturnal heavens? 'Something like magic, (says the pious Hervey,) has struck my mind on a transient and unthinking survey of the etherial vault, tinged throughout with the purest azure, and decorated with innumerable starry lamps. I have felt, I know not what powerful and aggrandizing impulse, which seemed to snatch me from the low entanglements of vanity, and prompted an ardent desire for sublimer objects.' What then must be his sensations, who, by means of the 'sight-invigorating tube,' and the lights of philosophy, is led to explore the upper regions of this celestial canopy, which the Creator has so distinctly marked with the wonders of his power!

The first thing that strikes a superficial observer, is the apparent multitude of those heavenly hosts; but this will be found to be an illusion, and probably is occasioned by their twinkling, and the confused manner in which by their distance they are made to appear; for, strange as it may appear in the ears of the unlearned, the stars that are visible in our hemisphere to the naked eye, even in the most favorable weather, do not amount in any one time to one thousand. But let it not be imagined, that in mentioning this, we mean to derogate from the glory of the Almighty, as it is revealed in the heavens, or by any means wish to insinuate that the number of the stars is within the power of our finite powers and capacities to calculate.—No; as the more we descend downwards in our researches among the animalcule creation, the more evident traces of divinity we discover, so the more we extend our discoveries upwards into the regions of the universe, the more do we observe of the glory of God.

The Heavens, indeed, declare the glory of God in a most emphatical manner, and the important invention of the telescope, aided by modern improvements, has brought systems and worlds to light, that were not dreamt of by the ancients. The heavens of Thales and Hipparchus were poor and thinly sown, indeed, when compared to those of Tycho Brahe and Flamstead; but what were even these to what the wonderful instruments of Dr. Herschel has brought to notice? Every new discovery of this indefatigable astronomer has tended to the glory of his Maker, and every increase of magnifying power has served to confirm the sublime truth, that 'the stars of heaven cannot be numbered.'

The *milky way*, or that white luminous tract which we observe in the heavens, is found to derive its appearance from the number of stars of which it is composed. No less than forty little stars are said to be in the *Pleiades* alone, and in the constellation of *Orion*, a number has been discovered, by far exceeding what can be observed by the naked eye in the whole heavens!

From an attentive examination of the stars with a good telescope, many which appear perfectly formed or single, to the naked eye, have been found to consist of two, three, or more stars; and Dr. Herschel, by the help of his glasses, is said to have discovered nearly 700 such stars. Besides these, the doctor has observed other appearances in the heavens, which he calls *Nebulæ* or cloudy stars; being apparently surrounded by a faint luminous substance of considerable extent; of these he has given us a catalogue of 2000, which he has described, and is of opinion that the starry heavens are replete with *nebulæ*. There are also several little whitish spots which appear magnified and more luminous when seen through telescopes, yet without any stars being distinguishable in them.

When to these grand, magnificent, and numerous appearances in the heavens, we add those *wandering stars* or planetary bodies we have just been considering, which, according to the appearances they put on, are denominated as stars of different magnitudes, together with that host of cometary orbs which occasionally appear and disappear from our hemisphere, who can forbear exclaiming:

'This gorgeous apparatus! this display!
'This ostentation of created power!
This theatre;—what eye can take it in?
By what divine enchantment was it raised?
How boundless in magnificence and might!'

The *fixed stars* are so called to distinguish them from the planets and other wandering bodies that move among them; for in respect to these they seem to be fixed, and with regard to each other they do not appear to change place. Thus, while the planetary bodies are not to be found in precisely the same place for any two successive days together, the stars, for instance, in the constellation of *Ursa Major*, or the *Great Bear*, have not been observed to alter their situation with respect to each other since the creation of the world. But there are few rules without exception, and here it must be observed that new stars have been discovered which were unknown to the ancients, and many of those which appeared in old catalogues are not now visible, while numbers seem gradually to vanish, and others appear to have a periodical increase and decrease of magnitude.

All the fixed stars, however, have an *apparent* motion round the heavens once in twenty-four hours; for although that of the star nighest the pole, and consequently called the *polar star*, be so imperceptible as to be scarcely distinguished, yet even that star appears to move in a very small circle; and this imaginary motion is occasioned by the same cause as produces the rising and setting of the sun; viz. the revolution of the earth on its axis.

Though the number of the fixed stars, visible to the naked eye, fall infinitely short of what a superficial observer might be apt to imagine; yet, from the great resemblance they bear to each other, and the confused manner in which they appear at such vast distances, it was found necessary by the ancient astronomers to class and arrange them under various figures and resemblances, to which they gave the names of several persons and things; and these imaginary likenesses, many of which, individually, obtained the name of persons celebrated in antiquity, were in general called *constellations*.

The distances of the fixed stars from the earth are supposed to be very great; so much so, that were a cannon-ball discharged from the nearest of them, it is computed that it would take 7,000,000 years before it could reach the earth. So far, indeed, are these luminous orbs removed from us, that their magnitude cannot be increased by the best magnifiers; and, notwithstanding the great extent of the earth's orbit or path round the sun, a fixed star does not appear to be nearer to us when the earth is in that part of its orbit nearest to it, than it seemed to be when the earth was at the greatest distance, or 190,000,000 of miles farther removed from the star!

Dr. Bradley calculates the nearest fixed star from the earth to be 40,000 times the diameter of the earth's orbit, and the distance of *Draconis* from the earth to be 400,000 times that of the sun, or 38,000,000,000,000 miles!!!

As to the size of the fixed stars, some idea may be formed from the vast distance at which they are visible. Were the sun removed to as great a distance from us as we are from the nearest of these stars, it is not probable that he would appear greater to us, and the different apparent magnitudes of the stars is supposed only to arise from their different distances. Indeed, from a comparison of the light afforded by a fixed star to that of the sun, it has been concluded that the fixed stars do not differ materially in magnitude from that luminary; and as it is impossible that these bodies can shine from such a distance with a reflected light, it has also been concluded, that the fixed stars must be of the same nature of the sun, and, like him, shine with their own native lustre.

GEOLOGY.

CHAOTIC OCEAN.

THE first well established fact worthy of notice respecting the history of our planet, is that there was a time when it was one vast ocean; without a continent, an island, a mountain, a rock, a metal, or a particle of solid matter upon its surface. It contained, indeed, the elements of all solid substances, which now appear so beautiful, so rich, and so various upon its surface; but they were in a liquid state—they were dissolved by heat or water, or more probably by both.

Whatever might have been the agent or agents, which dissolved and held in solution the rocks, islands, mountains and continents, now so firm and so lofty upon our globe, the fact is denied or doubted by no one, who has resorted for information to either of the two great volumes, the book of nature, or the book of revelation. The sublime and interesting account found in the first chapter of Genesis of the creation of our earth, is grounded upon the fact, that it was once a vast and general ocean. Such it must have been when it was without form and void, and darkness was upon the face of the *deep*, and the spirit of God moved upon the face of the *waters*, and commanded *dry land to appear*. These statements imply with a clearness little short of a direct declaration, that there was a time, when our earth was a vast deep—one great body of water—when dry land had not appeared.

This interesting fact, so clearly implied in the book of revelation, is fully corroborated in the older volume, the book of nature. The ocean now holding in solution many, perhaps most of the ingredients which constitute the solid and rocky masses—volcanoes which dissolve the body of mountains and pour them from their heights in a liquid form, so as to lay in ruins the fairest plains and cities below,—ledges, beautifully studded with crystals, and mountains intersected by seams of copper, tin, silver and gold, bear constant and infallible testimony, not merely to the possibility, but the certainty, that the most solid substances were once in a state of solution, and that our planet has been shaken to its centre by the war of its elements.

CONSTANT CHANGES.

History of the past, and observation of the present, unite their testimony to the fact, that the changes the earth has undergone since it came from the hand of its Maker, have been constant, and to a great extent gradual. Whatever construction shall be put upon the word day, as used in the only history we have of the creation of our earth, or however great might have been the changes it suffered during the six days there mentioned, no one can deny or doubt, that great and constant changes have taken place upon its surface since the period there referred to. The changes to which it is daily subject at the present time, must be visible to the most careless observer. The gradual but powerful and irresistible hand of time, even in the short space of 'threescore years and ten,' sometimes gives to extensive districts a new aspect and a new character. In many situations, rocks are constantly forming, in others they are in a state of decomposition; in one case the land is daily encroaching upon the sea, in another, it is carried into the ocean, and gives place to a bay or harbor. Volcanoes are pouring forth from the depths of mountains melted lava, which, by a sluggish but a powerful and awful momentum, carry destruction in their course, and bury flourishing cities in ruins, giving no warning to flee from their danger. While in one case mountains are throwing from their summits their own contents into the valleys beneath, in another the ocean is throwing up islands from its depths. In some instances, islands have arisen out of the sea in a night.

ORDER OF CREATION.

The general order of time in which the earth with its furniture and its inhabitants came to its present form, is sufficiently manifest from the only authentic history we have of its creation, from reason, and from observation. The first step which was taken to change the original chaos into a convenient dwelling-place for living, acting, and intelligent beings, was the formation of dry land. That was necessary to provide for the accommodation of animal and vegetable life. When provision was made for the existence and support of the vegetable kingdom, 'the earth brought forth grass and herb yielding seed after their kind, and the tree yielding fruit after his kind, whose seed was in itself after his kind.'

The creation, and continued production of the vegetable kingdom, made provision for the animal. Then the earth brought forth cattle that walk upon the earth, fowls that fly in the firmament of heaven, reptiles that creep in the dust, and fishes that move in the waters; and each after his kind.

But the tenant for whom the earth, with all its productions of animal and vegetable life, and so richly provided with furniture of a thousand kinds, was not yet created. His creation was to close this august work of the great Architect of the universe. Man was not formed and placed upon the earth, until the earth, was fitted for his reception, his convenience, and his happiness—until two great lights were formed, one to rule the day, and the other to rule the night, and the stars also—until the waters which were under the firmament were divided from those above the firmament, and gathered together in one place, and dry land appeared—until grass, herbs, and trees yielded seed and fruit after their kind, and cattle, the fowls of heaven, every creeping thing, and every living creature which moves in the waters, were formed, and made to produce others after their kind, and put in subjection to the lord of this lower creation.

Such is the general order in the work of creation, as learned from the Bible, from reason and from observation; and yet we have the strongest evidence, that this order was not strictly and minutely pursued through the whole process of bringing the earth into the state in which it is now presented to our view. The whole of the mineral kingdom, all rocks and metals, soils and mountains, were not completed before the creation of the vegetable and animal kingdoms were commenced. So far from it, rocks, soils, and metals, are daily forming at the present time. In many instances, vegetables and animals are deposited in solid rocks far below the surface of the earth. Nay, whole mountains of a great height, and hundreds of miles in extent, are composed of little else than the relics of animals. The greater part of these animals were evidently different kinds of shell fish. But fishes, of the kind that swim, are also found inclosed in solid rocks. In one instance, the relics of one fish were found in the mouth of another, apparently in the act of struggling for his freedom, when both captive and captor were suddenly arrested, and confined, where they closed their struggles and their lives together; and were afterwards converted into stone. In another instance, one hundred and sixteen different kinds of fish were found petrified within a short distance. It has been remarked, that fishes had probably met in general assembly, and were taken in the act of legislating.

In excavating the section of the Erie canal at Lockport, after descending twenty feet in solid rock, several rattlesnakes were found with the whole form, though in the state of stone, almost precisely retained. At the same place and nearly the same depth, a toad was taken from the solid rock, which when found was in a torpid state, which he had retained perhaps for thousands of years, but when exposed to air and heat soon gave indications of life, and after a short time gained strength enough to hop, but after a few hops closed his existence forever.

Not many years since, in the vicinity of Paris, there was found imbedded in solid rock, and forty feet below its surface, a board several feet long and eight or nine inches wide. At the same place a hammer was found, the handle of which, with the board was petrified, but the hammer being of iron, retained its natural state.

There are a few instances, among thousands, which might be mentioned, to prove that the changes our earth has undergone, have been gradual and constant, and that minerals, rocks and soils, and even mountains have been formed since the creation both of the vegetable and animal kingdoms commenced, and even after man was formed and had made some advances in the arts of civilization. Indeed no one can doubt for a moment, who has paid the least attention to the subject, that our globe has been subject to constant and important changes from the time that the materials of which it is composed were formed out of nothing, until the present moment. And these changes which come within our knowledge are so great, as to afford strong evidence that the earth could not have existed for a much longer period than that assigned by Moses.

SAILING ON LAND.—A sail was set on a car on our rail-road, yesterday afternoon, in the presence of a large concourse of spectators.—Fifteen gentlemen got on board, and flew off at the rate of twelve to fourteen miles an hour.—Thirteen persons and three tons of iron were carried about ten miles an hour. When going at the rate of about twelve miles an hour, and loaded with fifteen passengers, the mast went by the board, with the sail and rigging attached, carrying with them several of the crew. The wreck was descried by several friendly ship-masters, who kindly rendered assistance in rigging a jury-mast, and the car was soon again put under weigh. During the afternoon the wind changed, but this did not stop the sport.—[U. S. Courier, Charleston, S. C.

QUESTIONS

ON THE LAST NUMBER OF THE LYCEUM.

WHAT is the opinion of the inhabitants in the neighborhood of Stromboli respecting the stones thrown from it into the sea?

How do the eruptions from Stromboli differ from those in the neighboring islands?

How long have these eruptions been known?

What fundamental principles of religion are recognized by the Bramins?

In what do they acknowledge God as the Creator of the universe?

Do they inculcate dependence or independence in man? pride or humility?

What are some of the virtues that they particularly inculcate?

To what degree of thinness is gold leaf beaten?

How much water can be stained by one grain of blue vitriol?

Is a cord made longer or shorter by wetting?

How much heavier is lead than cork?

How much faster does sound travel in water than air?

By what means is air weighed?

What is the food of the silkworm?

Where does the palm tree grow, and what are its uses?

In what place in Pennsylvania are stockings wove?

What is held out by Dr. Woods as the surest foundation of character?

What is the essence of the Gospel?

Which is most profitable and most christian—DOING GOOD, or contending about doctrines?

How many school districts are there in the state of New York? How many children between 5 and 16 years of age?

Is Geology a modern or ancient science?

Has a knowledge of this science advanced slowly or rapidly with the last twenty years?

How does geology differ from geography?

Have we the means of learning minutely the changes the earth has undergone since its Creator formed it?